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SCIENCE NEWS LETTER

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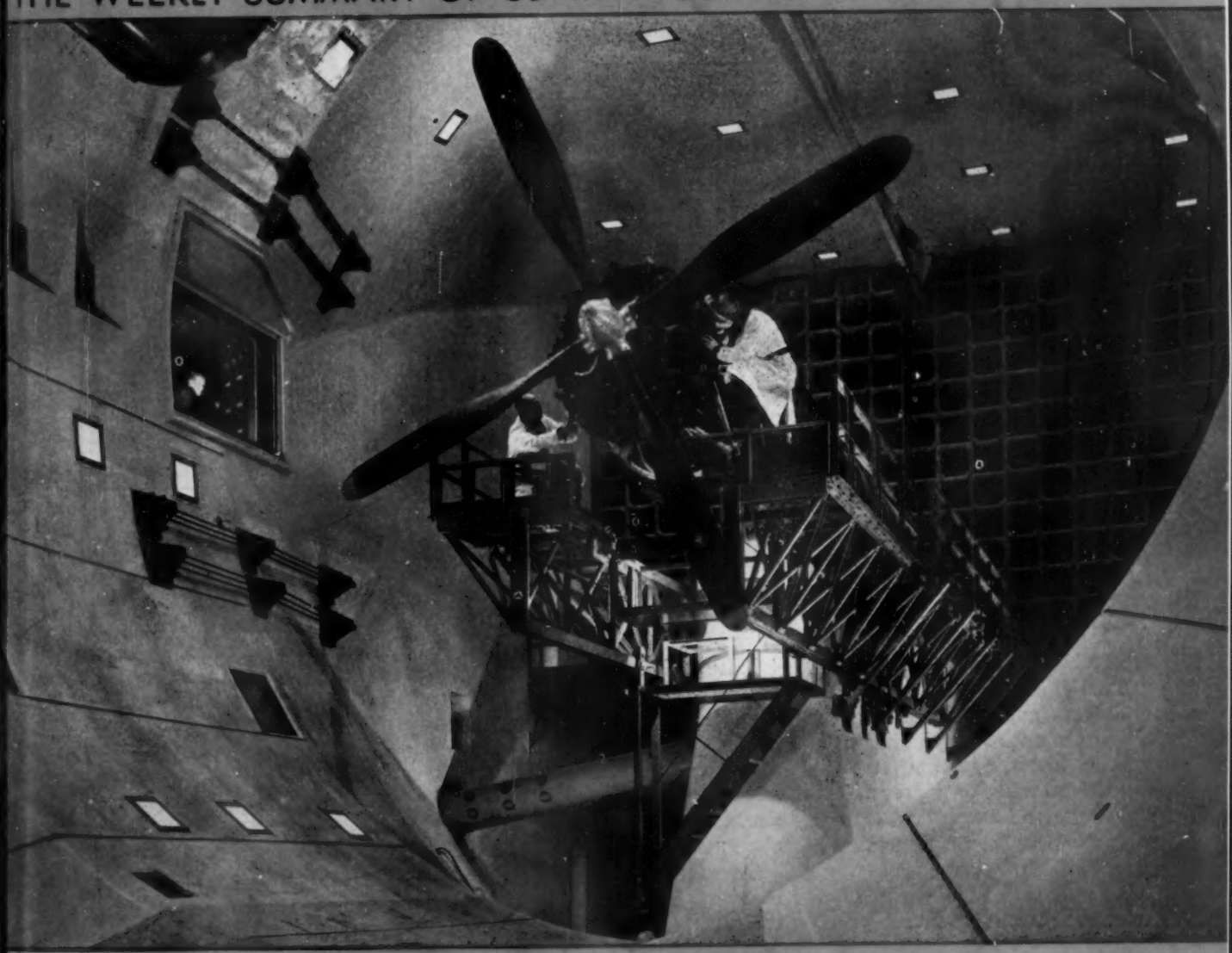

For Giant Propellers

See Page 120

A SCIENCE SERVICE PUBLICATION

A NEW RESOURCE HAS BEEN DEVELOPED

THE WEALTH of America has been wrought from her natural resources of fertile lands, wide forests and rich mineral deposits by the brains and muscles of her people.

But another resource is now available. A new source of wealth and well-being has been developing gradually and almost unnoticed which is tremendously important today and of still greater importance for tomorrow.

This new resource is the research laboratory.

Today, in hundreds of industrial and college laboratories, trained minds are expanding the world's knowledge, and applying the results of research to industry and to war.

In the Bell Telephone System, research has always been a fundamental activity. The telephone was invented in a research laboratory. And for years Bell Telephone Laboratories has been the largest industrial laboratory in the world.

Underlying modern research is the realization of vast latent values in nature. Although the lone genius does from time to time bring to light some part of these hidden values, only organized scientific research can assure the thorough exploration that will render the full measure of use for human welfare.

Research means imagining and experimenting. It means the searching out and bringing together of facts. It means clear statements of problems, precise measurements and keen analysis. It means tenacious following along unexpected paths.

These are the procedures of research. Its consummation is the grasping by subtle minds of relationships in nature no one has previously known. And on the basis of the broader knowledge so established are built new materials, new methods and new structures to serve the people of America.

The Bell Telephone Laboratories has now concentrated its efforts on communication systems and equipment for the armed forces. When the war is over its researches in communication will again be applied to an ever-improving telephone service in America.

BELL TELEPHONE SYSTEM

PHYSICS

Nearing Absolute Zero

Hope of lowering world's record low temperature by the use of magnetic means seen in attack on disorder within the central portion of atom.

➤ ALTHOUGH the world's low temperature record is now within a thousandth of a degree of the unattainable absolute of cold, there is a good hope that it will be pushed still farther downward, Prof. Peter Debye, Dutch Nobelist in chemistry and professor and chairman of the department of chemistry, at Cornell University, made known in an address before the Pennsylvania State College chapter of the national society of the Sigma Xi, the first of a series of such addresses through the nation.

This will be done by "attacking the disorder hidden in the nucleus of the atom," Prof. Debye said, by use of the magnetic properties of the inner core of the atom instead of the cloud of electrons about it. The influence of a magnetic field upon the spinning electrons made possible the drop in temperature from about a degree to a mere fraction of a degree.

Cooling is explained as an approach to "a state of highest possible order" and at a degree above absolute zero the disorder connected with the motions of the atoms and molecules has been largely removed, Prof. Debye explained. The next step is to bring order within the nucleus of the atom in order to get to an even lower temperature.

The phenomenon of paramagnetism will be used in these experiments, not yet performed, just as it was used in pushing the temperature to its present low level. When a paramagnetic substance, like a piece of soft iron, is demagnetized by taking the magnetic field away from it, it absorbs heat. The trick has been to cause it to cool off under these circumstances by preventing it from taking up heat from its surroundings.

This method of getting temperatures lower than are attainable by liquefaction of helium gas was proposed 16 years ago by Prof. Debye, then in Berlin, and Dr. William F. Giauque of the University of California independently, and applied a decade ago in several laboratories here and abroad.

In measuring temperatures just above absolute zero the low temperature gas pressure thermometers used at slightly higher ranges can not be used, but a satisfactory temperature scale can be based on magnetic measurements alone, Prof. Debye explained.

Absolute zero is minus 273.1 degrees Centigrade. Helium, the gas that is hardest to liquefy because its molecules have the smallest mutual attraction, boils at 4.2 degrees above absolute zero and by dropping the pressure to 1/200,000th of an atmosphere, a temperature of seven-tenths of a degree above absolute zero can be obtained. For lower temperatures, the magnetic method must be used.

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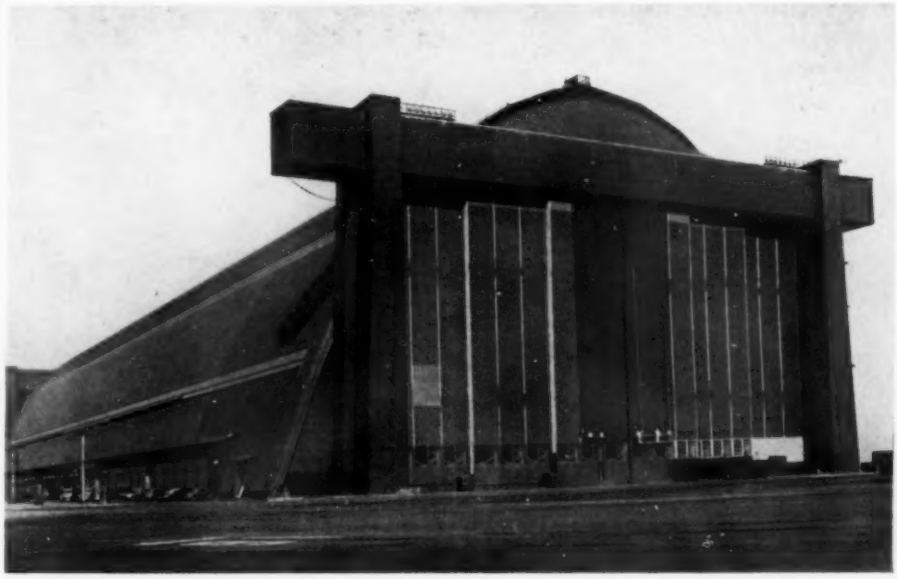

***FIRE-PROOFED**—Plywood is now being given a special treatment so that buildings, such as blimp hangars, can be made of wood without danger of fire. The wood is impregnated under vacuum pressure in heavy steel cylinders, so that the wood cells throughout the plies are filled with a flame-proofing combination of phosphate, sulphate and boron. The picture shows workmen applying camouflage paint to the plywood-pannelled doors of a West Coast hangar.*

MEDICINE

Sulfa Drug in Ointment Helps Prevent Gonorrhea

➤SULFATHIAZOLE in calomel ointment has proved efficient as a prophylaxis against gonorrhea, two Naval medical officers, Capt. John B. Kaufman and Lt. Comdr. Ammon B. Litterer, report. (*U. S. Naval Medical Bulletin,* February)

The ointment was used at the central prophylaxis station at San Diego, Calif., and at the border station at Tiajuana, Mex. Only two failures occurred in 2,016 treatments given a selected group who had not used any prophylactic measures prior to reporting for treatment. The two failures were in men who failed to report for treatment within two hours after exposure.

It is hoped that the addition of the sulfathiazole to the calomel ointment will not lessen the effectiveness of the calomel as a prophylaxis against syphilis. Further studies on this, the medical officers point out, would be desirable.

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MEDICINE

New Test for Sulfa Drugs Uses Newspaper and Acid

➤ A PIECE of newspaper and hydrochloric acid, familiar to every high school chemistry student, are the materials with which a new sulfa drug test has been developed by Capt. Robert

Hubata, S. C., A.U.S. The test is reported in *War Medicine* (January), published by the American Medical Association and the National Research Council.

The simple test will be valuable, Capt. Hubata believes, in determining whether or not a person has taken a sulfa drug.

It is made by moistening a small area on a blank strip of newspaper with a drop or two of a specimen of urine from the person being tested. A small drop of dilute hydrochloric acid, one part acid in four parts of water, is then placed on the center of the moistened area. The immediate appearance of a yellow to orange color shows the presence of a sulfonamide compound.

The method is based on the color reaction in the presence of acids between crude cellulose, such as newspaper, match sticks or pine shavings, and the arylamine group. Paper from refined pulp, for example white bond, will not give the reaction.

The color varies from orange yellow to orange, the yellow color, or one plus reaction, being obtained from persons who have recently stopped taking a sulfa drug.

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GENERAL SCIENCE

A. A. A. S. To Meet

American scientists to discuss war and post-war problems in Cleveland in September, after two years without conventions because of the war.

➤ THE AMERICAN Association for the Advancement of Science and its numerous affiliated scientific societies will hold their first full-dress wartime meeting in Cleveland next autumn, during the week beginning Sept. 11, Dr. F. R. Moulton, permanent secretary of the Association, informed Science Service. For two years these meetings have been suspended because of the war, but it is felt now that so many scientific problems of importance to the attainment of victory and especially in the setup of the post-war world require full discussion that a gathering of this size is justified.

For many years, A.A.A.S. meetings have been held during the week after Christmas. The last one to be held, at Dallas, Texas, was during the tense Christmas week following Pearl Harbor; it had been arranged long in advance and could not well be cancelled or postponed on short notice. However, holiday-season meetings were then given up for the duration by general consent. A meeting in the early autumn is not expected to place too much of a strain on transportation or hotel accommodations.

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PUBLIC HEALTH

Scarlet Fever Epidemic

Number of cases is mounting throughout the nation. Pacific coast states report three times as many cases during past January as the same month last year.

➤ SCARLET FEVER cases are on the increase in all parts of the country except New England and the west south-central states of Texas, Arkansas, Louisiana and Oklahoma, reports from state health officers to the U. S. Public Health Service show.

The number of cases mounted from 4,936 the week of Jan. 29 to 5,365 for the week ending Feb. 5. The five-year median figure for the first week in February is 4,037. The three Pacific coast states reported three times as many cases during January, 1944, as during the same month last year.

The cases in the current outbreak are very mild, according to information reaching the federal health service. The peak of the epidemic is expected this month or next, with cases continuing at a high level until May, when a sharp decline is foreseen. This unusually specific prediction for the course of the epidemic is based on records for many years which show that scarlet fever consistently follows this pattern of reaching a high point in February, March and April and falling off sharply in May.

Scarlet fever is caused by a germ of the streptococcus family. Children can be immunized against it, but because the reaction may be severe, public health officials feel they cannot advise it for all children. They believe the matter should be decided in each case by the parents and physician.

Production of a relatively new type of material for scarlet fever immunization, a precipitated toxin, has been de-

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SCIENCE SERVICE

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FOR AIR CREWS—Head injuries from low-velocity flying fragments of anti-aircraft shells have been considerably reduced since combat plane crews have been equipped with the helmets pictured in this official U. S. Air Forces photograph. The major on the left is wearing the M3 flyers' helmet, developed by the Ordnance Department, which can be worn by most members of a plane's crew. It is a one-piece type with hinged flaps to protect the headphones worn by airmen. The sergeant on the right wears the M4 helmet designed for gunners who have only limited space in their turrets.

layed because of war demands on the manufacturing laboratories.

Convalescent serum has also been tried to ward off attacks of scarlet fever in those known to have been exposed to a case. Since scarlet fever, however, has a short incubation period, developing within two to seven days, and usually is not diagnosed until the rash appears, it is not always possible to use the convalescent serum early enough for it to be helpful.

The disease usually starts suddenly with sore throat, nausea and vomiting and high fever. The rash appears on the first or second day, except in persons immune to this feature of the disease. Because of the danger of complications, patients should be under the care of a physician. Scarlet fever patients must be isolated. The usual quarantine period is 21 to 28 days.

Measles and Meningitis

Increasing numbers of measles and meningitis cases throughout the nation and an outbreak of typhoid fever in Indiana with a decline in deaths in 90 large cities are also reported by the U. S. Public Health Service.

The total number of deaths in the large cities, which include about 40,000,000 of the nation's population, were 9,455 for the week ending Feb. 5, considerably below the 9,937 reported for the week ending Jan. 29 and also, for the first time in many weeks, below the three-year average for the first week in February of 9,736.

Measles cases increased from 15,403 to 18,648 for the week ending Feb. 5. The five-year median figure for this disease is 13,444. Both measles and scarlet fever cases are occurring in all sections of the country. In the nation's capital, there is more scarlet fever than in the surrounding states, with the picture just reversed for measles.

Meningitis has climbed to a very high level, with 527 cases reported the week of Jan. 29 and 571 the week of Feb. 5, compared with 330 for the first week in February, 1943.

Indiana's typhoid fever outbreak, with 70 cases the week of Feb. 5, and a total of 111 cases reported since Jan. 22, is centered around the towns of Warsaw and Peru. Cases have occurred in rural areas in eight counties. Cottage cheese contaminated with typhoid fever germs is believed to have caused the outbreak. Preliminary investigations traced all cases to this one factor.

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STATISTICS

Cost of Raising Child On Middle Income Given

➤ FOR FAMILIES with $5,000 to $10,000 a year incomes, the cost of bringing up a child to the age of 18 averages $20,785, the Metropolitan Life Insurance Company announces in a study supplementing earlier studies on the cost of child-raising with $2,500 a year family incomes.

At the higher level, the total cost breaks down into the following: Cost of birth, $750; food, $3,628; clothing, $1,697; shelter, $5,774; education, $283; medical care, $846; transportation and recreation $2,787; sundries, $572. Added to this is a mortality charge of $212 and interest on the money expended, compounded annually at the rate of 2½%, of $4,236 for the 18 years.

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HORTICULTURE

Aerosol Method Used To Secure Seedless Fruit

➤ AEROSOLS, at present used exclusively for killing germs in the air of hospital rooms and similar enclosed spaces and for combating malaria mosquitoes on the fighting fronts, may find a peacetime occupation in the treatment of plants with growth-control substances to secure seedless fruit from unpollinated flowers, to prevent premature fruit drop, and for other horticultural purposes.

This suggestion is offered by three U. S. Department of Agriculture scientists, C. L. Hamner, H. A. Schomer and L. D. Goodhue, on the basis of a series of experiments performed at the Department's great experiment station at Beltsville, Md. (*Science,* Jan. 28)

Aerosols are solutions of chemicals in some readily evaporated liquid in a container kept under relatively high pressure. When the pressure is released, the liquid is ejected into the air in an exceedingly fine mist, carrying the chemicals with it. Aerosols have been found many times more effective than ordinary sprays, as means for diffusing chemicals through spaces.

An aerosol of naphthoxyacetic acid, one of the plant growth-promoting substances, released in a closed space containing a number of flowering but unpollinated tomato plants and left with them for 16 hours caused the setting of a high proportion of fruits, while untreated controls set very few. The aerosol-treated tomatoes ripened larger than the less numerous controls, and were all seedless.

It was even found possible to get tomatoes to set fruit in the open field when the aerosol was released in the immediate neighborhood of their flowers. Further experiments are in progress.

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MEDICINE

New Type Ear Defenders

A synthetic material better than rubber makes models which completely close the ear canal, eliminating almost all but bone-conducted noise.

➤ NEW TYPES of ear defenders, which shut out practically all noise except that perceived through bone conduction, have been developed by Dr. Norman A. Watson and Dr. Vern O. Knudsen, of the University of California at Los Angeles, in one of the few war research projects of the National Defense Research Committee so far published.

The new defenders are made of Neoprene, one of the synthetic rubbers, which the scientists state in their report to the Acoustical Society of America is "superior to rubber and entirely adequate for the purpose."

The superiority of the synthetic material for ear defenders comes from its being permanent; resistant to lanolin (which is about the same as ear wax), soap, water and cleaning alcohol; non-irritating and non-toxic; non-inflammable; almost flesh-colored and therefore inconspicuous in the ear; and, after being washed with soap and water, without objectionable odor.

Some 50 different types of ear defenders were designed, molded and tested. The insulations against sound obtained with the widely different types were surprisingly near to the same value. This fact and many special tests, including one in which a heavily padded cloth hood was tied over the listener's face, head and ears, showed that the controlling factor in limiting the insulation possible with ear defenders is probably the vibrations of face and skull bones caused by the air waves.

On the basis of all tests made, two models were finally chosen for use when complete closure of the ear canals is permissible. These look alike, but one was specially designed for unusual shapes of ears. This has an extra compartment filled with an isoplastic, "tacky," non-elastic plastic loaded with metallic or metal oxide dust. Because of this "fill," the ear defender can be deformed to almost any shape of ear and will hold that shape.

A third type of ear defender was developed to provide automatic pressure equalization through it. This was accomplished by a drilled, cotton-packed insert sealed into the dividing wall of one of the ear defender models.

For those who have trouble removing the ear defenders, a modified design provides a longer flap at the outer end.

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FOR THE NAVY—The safety of Allied harbors and ships is the big responsibility of the men who have the job of laying and keeping intact the extensive network of anti-submarine and anti-torpedo nets put across the mouth of a port. The floats and buoys which support the tremendously heavy nets get careful attention, as well as the meshes themselves. A seaman is shown in this official U. S. Navy photograph spraying a pile of buoys with anti-fouling paint.

CHEMISTRY

Scientific Fraternity Elects Honorary Member

➤ DR. Florence B. Seibert, known for her research on the chemistry of tuberculosis, has been elected a national honorary member of Sigma Delta Epsilon, graduate women's scientific fraternity.

Dr. Seibert, a chemist and bacteriologist of the Henry Phipps Institute of the University of Pennsylvania, has focused her research during the last two decades on the study and isolation of the active principle of tuberculin, which is widely used in the detection of tuberculous infection in man and animals. She has isolated the substance, a protein, in highly purified form and has studied its biological and chemical properties.

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CHEMISTRY

Nothing Makes Vitamins

High vacuums achievable by means of very efficient pumps make it possibe to evaporate vitamins A and E out of oils without use of damaging heat.

➤ NOTHING is responsible for the present greatly increased supply of better and cheaper vitamins. Or if not exactly nothing, then as near to it as technological ingenuity has been able to contrive, and in very large quantities, at that.

The scientific sense behind this apparent paradox was explained before the Swarthmore College chapter of the Society of the Sigma Xi by Dr. Kenneth C. D. Hickman, vice president and director of research of Distillation Products, Inc., Rochester, N. Y.

The "nearly nothing in large quantities" is the very high vacuum achievable on a commercial-plant scale by means of exceedingly rapid and efficient pumps, usually operating in batteries. It is now possible to obtain exceedingly low atmospheric pressures within the large stills where vitamins A and E are evaporated out of the oils in which they occur in nature, and condense them in purified form, all without the application of heat that would damage or destroy them.

Although these pumps get nearly all the air out of any closed vessel, the resulting vacuum is nowhere nearly as perfect as that believed to obtain in interstellar space. Out there, there is on the average only one lonely molecule for every cubic meter of emptiness. In ordinary, sea-level air there are 10^{19}, or 10,000,000,000,000,000,000, molecules in every cubic centimeter. The new pumps get the molecular count per cubic centimeter down to 10^{13}, or 10,000,000,000,000—which is doing pretty well, as human contrivances go.

At this reduced atmospheric pressure, a molecule evaporating from a liquid surface within a still could travel a whole inch without bumping into an obstructing atmospheric molecule. In practical terms, this has meant the possibility of large-scale production of vitamins and their preparation in new and more potent compounds.

The patterns of the molecular stills used in the industry have become more complex, and their size progressively greater, as the capacity and efficiency of the pumps increased. To expose greater evaporating surfaces of oil, arrangements were first made to have it flow constantly in a falling film. Then, to speed the flow, rotating plates were introduced, which adds centrifugal force to the pull of gravity.

The most complicated still in present use, Dr. Hickman said, "consists of a centrifugal evaporator over which some hundreds of pounds of oil may be spun each hour, housed in a vacuum kettle rather like an Indian wigwam, and evacuated by a train of pumps two stories high."

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STATISTICS

More U. S. Deaths

But the 1943 upturn in mortality rate due to the war is reported as "not at all severe." Average length of life decreased to 63.8 years.

➤ THE UPTURN in national mortality due to the war, as seen in the death rate among industrial policyholders for the year 1943, is "not at all severe," statisticians of the Metropolitan Life Insurance Company report.

The rate for that year, 782 per 100,000 policyholders, is still less than for any year prior to 1938 and is only 3.9% above the average of the last five years.

For the nation as a whole the 1943 death rate is estimated at 10.9 per 1,000 population, as compared with 10.4 in 1942, an increase of about 5%.

The sharpest rise in the death rate among the policyholders occurred at ages 20 to 24 among white males. This was up 84% over 1942 and 144% over 1941.

Among women of military age the death rate in 1943 was lower than in 1942.

The higher mortality also caused a decline in the average length of life of industrial policyholders to 63.8 years, or three-tenths of a year less than in 1942.

A major factor in the increase in mortality in 1943 was the sharp rise in deaths attributed directly to the war, deaths through enemy action, deaths in prison camps, and deaths from accidental injury among military personnel.

Apart from war deaths, the largest increase in mortality in 1943 was due to influenza and pneumonia, the Metropolitan report states. At that, the death rate from influenza and pneumonia combined in 1943 was only 25% above the minimal rate recorded in 1942 and only one-half the annual average of about 82 per 100,000 for the five years prior to development of serum treatment and chemotherapy. Another heartening comparison is between the 1943 influenza-pneumonia death rate of 41.3 per 100,000 and the 1918 average for the year of 542.2 per 100,000.

Deaths from heart, kidney and blood vessel diseases increased, in association with the rise in influenza and pneumonia. Measles, whooping cough, diphtheria, diarrhea and enteritis and meningitis also showed slight increases in 1943.

On the favorable side of the picture, tuberculosis, syphilis, appendicitis and diseases associated with childbirth recorded new minimum death rates in 1943.

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INVENTION

Mower to Cut Weeds Uses Whirling Chains

➤ A NOVELTY MOWER, on which patent No. 2,341,486 was granted to H. C. Swertfeger of Jarrett, Va., is not intended for making hay, but rather for weed destruction along highways and in other places where stumps, stones and other obstructions make the use of an ordinary cutter-bar machine impossible.

On a rotating cylinder, powered with a takeoff from the tractor engine, short pieces of chain are fastened, their lengths graduated to form an over-all spiral pattern. When the cylinder spins, centrifugal force causes the chains to whirl, and they lash to shreds any weed they encounter. But if they strike stump or stone they simply glance off, neither breaking nor stalling the machine.

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CHEMISTRY

Plastics and Foams Made From Plasma Proteins

➤ FROM the proteins in blood plasma scientists have succeeded in making plastics, films and foams for clinical use, as well as the more familiar immune globulin for measles prophylaxis and isohemagglutinins for blood typing, Dr. Edwin J. Cohn, of Harvard Medical School, reported to the New York Section of the American Chemical Society.

The plastics are made from fibrinogen, the substance in blood upon which the physical properties of the blood clot largely depend. In connection with thrombin this can be made into fibrin films used as membranes, and into the fibrin foams used to check bleeding in surgery on the nervous system.

Albumin from blood, also available now as a stable, dry, white powder, is put up in 25% water solution in the 100 cubic centimeter Army-Navy package and used for treatment of shock. This approximately three-ounce solution is equivalent to a pint of blood plasma.

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AERONAUTICS

Huge Propellers Examined In New Test Cells

See Front Cover

➤ AIRCRAFT propeller parts that would not fail in 10,000 hours of actual flight can be vibrated to destruction within a very short period by an electronic apparatus in the experimental engineering laboratory of the Curtiss-Wright Corporation.

Parts that have passed this test are assembled for further study as complete propellers. New test cells, just unveiled at the Caldwell, N. J., laboratory, are big enough so that great propellers, such as those on the Mars and tomorrow's even bigger ones up to 30 feet from tip to tip, can be tested. Since the testing of a propeller depends upon the control of the engine, propeller and engine are tested and controlled as a unit in this new laboratory set-up. The blades are subjected to the buffeting of wind and the stress of vibration just as they would be if mounted on a bomber in flight.

For endurance tests, covering several hundred hours, four or more engines of the same model are used interchangeably, since an engine's performance occasionally varies, causing changes in propeller testing conditions.

The picture on the cover of this SCIENCE NEWS LETTER shows the largest propeller in existence, 16-feet-8-inches from tip to tip, being mounted for testing in one of the 38-foot-square cells. The need for rugged tests becomes clear when it is realized that centrifugal force exerts a 97-ton pull on each of the four blades of this propeller. In terms of the 16½-foot propeller on the giant Mars, this pull on each blade is 45,000 pounds greater than the gross weight of the fully loaded ship on its recent trans-Pacific flight.

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PLANT PHYSIOLOGY

Maybe Moon Does Affect Plants After All

➤ BELIEF that the moon has something to do with the behavior of living things may have some scientific justification after all, experiments on trees by Prof. Harold S. Burr of the Yale School of Medicine seem to indicate.

Prof. Burr inserted a pair of electrical contacts into the trunk of a maple tree, about five feet apart and at a depth that placed them next to the cambium, or layer of actively growing cells that build new layers of wood and bark. They were hooked up to delicate electrical recording apparatus.

Approximately once a month, he reports, the records show there was a "tremendous and very sharp rise" in the average potential difference over the path of living tissue between the two points. Close records were kept of temperature, humidity, barometric pressure and other weather factors, and none of these were found in step with the changes in the tree's electrical state.

Something that happens approximately once a month must be responsible, unless the changes are due only to some internal rhythm within the plant itself and not to any outside factor. The moon seems to be the readiest object to hold responsible; although Prof. Burr is careful to point out that thus far no actual casual connection has been demonstrated. However, he states, "on the basis of the evidence so far collected, one could predict by means of electrical measurements the changing lunar phases within 48 hours."

In any case, he feels that the phenomenon is of sufficient interest to justify further research.

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IN SCIENCE

EDUCATION

Yale To Have Institute For Ex-Service Men

➤ SERVICE MEN mustered out when the war is over may have a chance to go to college in a special Institute of Collegiate Study for Ex-Service Men, to be established for them at Yale University.

The question of what sort of education should be offered ex-service men is now being studied at Yale, it is revealed by the annual report of the University's president, Dr. Charles Seymour.

"It is the responsibility of the University to aid men returning from the war to make the transition from military life to the life of free self-reliant, responsible citizens of a democracy," President Seymour believes. Despite their maturity, he feels, the ex-service men will be unprepared for normal college life.

"They will need to learn how to be responsible for themselves, to think and judge according to their own lights, and to choose and execute the purposes of their own lives," he said.

After the war, the accelerated year-round program should be abandoned, President Seymour indicated, because it would be "clearly unprofitable for the student and might easily become disastrous for the professor."

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INVENTION

Snow Grinding Machine Hastens Melting Process

➤ FROM SNOWY New England comes an idea for a contrivance with the odd-sounding name of snow grinding machine. The invention of W. J. O'Brien of Boston, it is covered by patent No. 2,341,471. The object is to break the masses of consolidated snow that often clog streets in northern cities into small fragments, so that they will melt more easily. The snow lumps are fed through a cylindrical hopper in which there is an open arrangement of fixed rods, between which whirl strong steel bars extending from a central shaft. The chopped-up snow is delivered through a funnel-like chute to the side of the highway or into a removal truck.

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NCE FIELDS

METALLURGY

Valuable Alloy Metals Separated by New Process

➤ TWO ALLOY metals of great importance in steel production, molybdenum and tungsten, occur together in certain ores, but they cannot advantageously be used together. A chemical process for their separation is the subject of patent No. 2,339,888, granted to George S. Smith of Uravan, Colo., and assigned to the United States Vanadium Corporation.

Mr. Smith's process is based on the fact that both molybdenum and tungsten react toward certain lighter metals not as bases but as acids. Accordingly, he gets them both out of the ore together by mingling them with a very strong solution of caustic soda, to form sodium molybdate and tungstate respectively. After filtering, he first acidifies the solution containing the two salts, then adds sodium sulfide. This forms an insoluble precipitate with the molybdenum, which can be filtered out. The sodium tungstate can either be reduced directly to solid form by evaporation, or converted to insoluble calcium tungstate which is then filtered out.

Science News Letter, February 19, 1944

RADIO

Post-War Television Sets Will Require Trained Men

➤ THE ADVENT of television should have a highly constructive effect in requiring adequate training for radio service men, declared Arthur Stringer, of the National Association of Broadcasters, at the winter technical meeting of the Institute of Radio Engineers in New York. No one without adequate training, he said, will be able to handle television service satisfactorily.

"In sound radio the ear will tolerate considerable departure from maximum fidelity. Unlike the ear, the eye will not tolerate a poor or slightly defective image," the speaker stated.

A television set is a precision instrument requiring a skilled workman for repair work, he pointed out. Radio engineers and manufacturers will have to design and produce proper testing equipment for their use.

Radio servicing was generally unsatisfactory in the United States before the war, Mr. Stringer indicated, because of the lack of training on the part of many repair men. Approximately 60,000,000 radio sets in use in the country means enough servicing to warrant basic training, he declared, and urged radio engineers to plan sets with sturdy construction, assuring a minimum of servicing and ease of repair when they do break down.

Science News Letter, February 19, 1944

CHEMISTRY

No Captured German Tires Wholly Synthetic Rubber

➤ CAPTURED German army tires analyzed are found to contain some natural rubber, and are not made entirely of synthetic rubber as commonly reported.

Four American scientists, working in the research laboratories of the American Cyanamid Company in Stamford, Conn., developed two methods of detecting natural and synthetic rubber in tires and other materials. All German tires examined by them contained natural rubber in varying quantities.

Of ten tire treads, one was wholly plantation rubber, and nine were pure Buna S, the synthetic butadiene-styrene rubber on which the Germans presumably depend principally. Of ten carcasses, all contained from 20% to 100% rubber. The tubes were 75% to 100% natural rubber.

The two methods developed for detecting natural and synthetic rubber and determining the proportion of each kind in a tire or other article are the result of two years of research, a report to the American Chemical Society states. One is measurement by the phosphorus content, the other is by use of infra-red light.

During growth, natural rubber trees and plants acquire minerals from the soil. Among these minerals is phosphorus. Some phosphorus gets into the rubber produced. Synthetic rubber has little or none of it. The amount of phosphorus in rubber can be measured by ultraviolet spectrochemical analysis.

The second method is by study of infra-red spectra. This determines what substances are present by the way they absorb infra-red radiations—light of the longest wavelengths. Each type of rubber molecule produces a different spectrum. A careful method was developed to separate the pure rubber from the tire before making such tests.

Science News Letter, February 19, 1944

MEDICINE

Frogs for Pregnancy Tests Can Soon Be Bred in U. S.

➤ WITHIN six months the war-caused shortage of African frogs for pregnancy tests will be overcome and tens of thousands of frogs should be available in this country, it appears from a report by Christopher W. Coates and Dr. Abner I. Weisman, of New York. (*Journal, American Medical Association,* Feb. 12)

Attempts at breeding these animals in this country prior to 1943 have not been very successful. "Heartening news" of a frog breeding method developed in the midst of war conditions in Switzerland, has recently arrived in this country.

The method consists essentially in injecting both male and female frogs with sex-gland stimulating hormones. Mating and spawning follow within eight hours.

Arrangements are now being made to breed these African frogs in New York. The scientists believe that as soon as considerable numbers are available, the African frog will entirely replace rabbits, mice and rats for pregnancy diagnostic tests.

The New York Zoological Society and the Jewish Memorial Hospital, with which the scientists are affiliated, plan to aid in making the results of the research available to all who are interested.

Science News Letter, February 19, 1944

POPULATION

War-Swollen Cities May Lose Many Migrants

➤ CITIES which have increased greatly in size due to war activities can probably settle down to a more normal existence after the war as these increases appear unlikely to be permanent.

War workers are generally pessimistic about their chances of holding their jobs after the war, states Jerome S. Bruner, associate director of Princeton University's Office of Public Opinion Research. (*Mechanical Engineering,* January) He reports that the highest percentage of readiness for migration is in shipbuilding cities, next highest in aircraft towns and the least in steel and automotive centers.

Thus Detroit, San Francisco, Oakland, Los Angeles, Washington, Norfolk and other cities which have undergone an increase of from 100,000 to nearly 400,000 since the war may lose a large percentage of this migrant population after peace is declared.

Science News Letter, February 19, 1944

ARCHAEOLOGY

Ancestors of the Incas

The culture of the prehistoric race gradually increased in complexity over 2,000 years. History traced by the remains of statues, temples, baths.

By EDITH GOLDMAN

➤ THE EARTH-WRITTEN story of how the culture of the prehistoric ancestors of the Incas originated in Colombia, and then gradually developed for 2,000 years, leaving a 4,000-mile trail of temples and statues, has been brought to the United States by a leading South American archaeologist, Dr. Gregorio Hernandez de Alba, director of the National Archaeological Museum of Colombia.

Scientists Disagree

Scientists disagree as to how this cultural cycle was created. Some think that only customs, arts and traditions were passed along from tribe to neighboring tribe. Dr. Hernandez de Alba, however, believes that in many cases the Indians themselves were uprooted from their home grounds by other tribes on the warpath, and that they spread their culture by settling in new locations.

This long, slow cycle of Indian culture started in Colombia, moved southward into Bolivia, then northward again through Peru, and was within 50 miles of its original starting point when the disrupting invasion of white men from beyond the seas froze it suddenly in its tracks.

Oldest Remains

In San Agustin, 560 miles from Bogota, capital of Colombia, are found the oldest archaeological remains in the Andean region of South America. And here, states Dr. Hernandez de Alba, was the starting point of a cycle that was to develop into the highest of South American cultures, that of the Incas.

Over 2,500 years ago, one of the most primitive peoples on the South American highlands were the San Agustin Indians. Their civilization is lost in antiquity, and only by archaeological studies can their customs, their traditions, their way of life be partially pieced together.

A prehistoric art gallery composed of over 300 grotesque statues set up in the forests of San Agustin valley gives a tangible picture of this lost civilization. The prehistoric stone images have many features in common, such as bushy hair, long canine teeth, fantastically broad noses and no necks. In many crude statue-pillars, the heads are from one-third to one-half the entire height.

Another key to this prehistoric community is the excavation of three bathtubs hewn from a rocky slope during the same period and in the same region. (*See SNL,* Nov. 13, 1943) The prehistoric hydraulic engineers cleverly diverted a nearby stream into a series of little canals headed down the slope to provide a continuous water supply for these elaborately carved baths.

Baths for Ritual Uses

Although there is no written record of the religion of this people, Dr. Hernandez de Alba believes that these baths were for ritual uses. Bathing is symbolic of purification in modern Indian culture, and now this present-day practice may be traced back 2,500 years.

The story delved from the earth is one of constant change during the prehistoric era. According to Dr. Hernandez de Alba's interpretation, enemy tribes of inferior culture dislodged the San Agustin Indians, driving them southward.

More highly developed sculpture, weapons, architecture and pottery uncovered in the southern regions indicate an increasingly high cultural level accompanying this spread of the early civilization, he explains. At Tiahuanaco, Bolivia, the true Inca culture came into being.

Influenced All Tribes

This newly developed Inca culture, Dr. Hernandez de Alba continues, seeped northward, influencing all tribes in its path. When the Incas were less than 50 miles from San Agustin, having practically completed this historical cycle, the Spanish conquest abruptly stopped any further activity.

All along the path taken by the travelling culture, Dr. Hernandez de Alba has found evidence in the form of archaeological remains to substantiate his theory.

As the culture moved southward from San Agustin, the general outlines of

GOD AND MAN—The big-eared stone image on the left is thought to represent an ancient Colombian god because of its location in a temple. The entrance of a hall is frequently guarded by the statue of a human being, such as the one on the right.

the statues remained the same, but a more skilled carving technique was developed. In Ecuador, Peru and Bolivia the figures were covered with carved reliefs, which grew intricate in the southern areas.

Complexity of Architecture

Architecture followed the same trend of greater complexity as the people migrated towards the south. Two stone slabs for the base of the structure and one for the roof formed the dolmenic type of construction used in Colombian temples and tombs. To the south, *tolas,* Indian mounds, made of stone heaps, and *pircas,* stone fences, were predominant. Reliefs were carved on the fences.

Construction of stone buildings such as the temples of Chavin in Peru and the palace of Tiahuanaco in Bolivia, marked the height of pre-Inca architectural development. Inca architecture was the most highly developed of all.

Dr. Hernandez de Alba's theory of a migrating Indian culture is borne out by pottery remains dug from the earth. A poorly styled, crude type of three-legged bowl is representative of San Agustin pottery. Very few variations in style and lack of any decoration emphasize the primitive nature of these Indians. Remains unearthed in areas farther south exhibit increasingly greater perfection of form, style and decoration of the original tripod.

Stone Knives Uncovered

Implements found in the San Agustin region generally resemble the type used hundreds of centuries ago in the Stone Age. Stone knives, hammers, points and axes have been uncovered. The height of development attained by these tribal weapons is exhibited in the polished stone axes and chisels.

Stone implements were rarely found in excavations farther south. Apparently, with the rise in the cultural level came the use of copper and bronze instruments in Peru and Bolivia. Again, the high point was achieved by the Incas in the development of tools.

Where the primitive Indians living in San Agustin came from is still shrouded in mystery and legend. All earlier cultural development is a matter of conjecture. On the basis of the recently unearthed archaeological treasures, the story in stone is presented by Dr. Hernandez de Alba as a record for posterity.

***DRY WATER HOLE**—Ancestors of the Incas once drank cool water from the hole in this rock, now filled with weeds. It was they who carved the animals in the rock. The lizard on the right is supposed to have the face of a human.*

GENERAL SCIENCE

Washington the Scientist

Balloons, submarines, crop rotation, "camouflaged" military uniforms and a patent law were among the interests of the first president of the United States.

➤ IF George Washington could see the world as it is today, he might not be amazed at modern scientific achievements. He might enthusiastically accept them as very satisfactory developments of ideas born during his day, some of which he financially backed.

Submarines, power boats, aviation and scientific farming were not unfamiliar to Washington, although in many cases they were, in his time, mere shadows in relation to what was to come.

If you look back to your grade school impressions of Washington, you would probably picture little George tearfully but truthfully standing by the fallen cherry tree, hatchet in hand. And you would probably recall teen-age George surveying the wilderness. The breath-taking exploits of Washington the soldier and statesman would also be clear in your mind. But, what many history books completely overlook is Washington, the great scientist and engineer.

As an engineer, Washington was truly a self-made man. No scientific schools existed in the American colonies at that time, and a scientific education had to be obtained by home study of necessity. This engineering training was useful to him in later life (*Turn to next page*)

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Do You Know?

Orange seed contains enough oil to make commercial extraction profitable.

There are 6,807 *hospitals* in the United States with over 853,000 beds.

There are 94,000 square miles of potential farming and grazing lands in *Alaska*.

Chicken fat, boiled gently to remove the water, may be used instead of butter in cakes, cookies, sauces and bread.

The U. S. Government requisitioned nearly one-half of the 350 commercial airline *planes* at the outbreak of the war.

A new *X-ray machine* now in use in a war production aircraft plant is capable of inspecting 17,000 airplane castings in 24 hours.

Phosphorescent paints developed for war purposes may in post-war days be used for interior markers for exits, guide lines and obstructions in factories and public buildings.

Huge *canyons* on the bottom of the sea extending out from the continents give every indication of having been cut by rivers on dry land and later submerged in the ocean.

Although there is no less *rainfall* in the United States than there was 200 years ago, there is a growing shortage of water, with the disappearance of topsoil and forest cover.

The longest *air freight* line in the world operates from Patterson Field in Ohio to India; operating on a regular schedule, great cargo planes carry war essentials to American troops in the Far East.

New Haven, Conn., has appropriated $10,000 to be used in preparing post-war *housing* plans; this is reported to be the first direct appropriation for this purpose made during the war by any municipality.

Wartime 100-octane *gasoline,* greatly improved since Pearl Harbor, is not gasoline in the ordinary sense, but is a superfuel produced by rearranging the petroleum hydrocarbon molecules through use of agents called catalysts.

From Page 123

when planning military strategy, supervising the layout of the nation's capital, and designing a blueprint for the nation.

Aside from the affairs of state of the newborn nation, Washington had an active interest in all scientific developments of the day.

Washington stressed the importance of getting into the western wilderness to extract its hidden treasure. For this purpose, he was convinced of the need of inland water transportation, and closely followed all attempts made to discover a practical power boat.

As a prologue to modern aviation, Jean Pierre Blanchard, a Frenchman, made his first balloon ascension in this country in 1793. Washington presented Blanchard with a remarkable document which the 18th century aviator called his passport. It was addressed to all citizens of the United States recommending that in his passage, descent, return or journey elsewhere they aid him with good will and any assistance which might be necessary.

The earliest known type of American submarine also attracted Washington, who financially aided its inventor, David Bushnell. As described by Washington, this machine, built to accommodate one man, could carry itself under the water at any given depth, and, by means of an attached powder-filled appendage, could strike at an anchored ship some distance away and destroy it.

This submarine was operated in New York Harbor in 1776. The purpose was to attach a bomb to the keel of Admiral Howe's flagship. However, the bomb failed to hold and exploded about one hundred feet from the ship. Half drowned, the operator of the submarine reached shore, his mission a failure.

Washington later wrote to Jefferson concerning this idea. "One accident or another always intervened. I then thought, and still think, that it was an effort of genius, but that too many things were necessary to be combined to expect much from the issue against an enemy, who are always upon guard."

Tobacco was Virginia's chief crop at that time. However, constant tobacco crops soon exhausted and ruined the soil. As land in those days was cheap and plentiful, the planter light-heartedly cleared new lands and let the old revert to wilderness.

Recognizing the problem as not one so much for his contemporaries, but as one of conserving the land for posterity, Washington developed a system of crop rotation, demonstrating to neighboring farmers a practical soil conservation procedure.

Washington was responsible for breeding the first mules in this country. The King of Spain sent two jacks and two jennets to him as a gift. One jack died on the way over, but the remaining one upon arrival was promptly christened Royal Gift. Lafayette also sent some from France. The two strains were crossed, producing an animal which Washington christened Compound. Mules, a cross between the imported jacks and mares, were very quickly utilized by American farmers.

Even though camouflage as a phase of warfare was to appear over a century later, Washington was probably the first general to recommend concealing uniforms. He took particular notice of the fact that the blazing red of the British army and the blue and buff of his own army were not very satistactory when compared with the buckskin uniforms of the backwoods units, which blended with the surroundings. He recognized the fact that this dun-colored skin garment with a loose-fringed coat and short shoulder cape blurred the outline and gave the garment a foliage-like sway when the wind blew.

To encourage further technology and invention in America, Washington advocated and signed the first law framed by Congress for the protection of American inventors by patents.

Science News Letter, February 19, 1944

ENGINEERING

"Duck's" Cooling System Reverses Fan Action

➤ DUCKS, those amphibian vehicles that are trucks on land and boats in the water, have a new cooling system offered in the invention of E. T. Todd of Pontiac, Mich. The radiators in such existing vehicles must be located inboard and below bow level, for protection; but this cuts off free access of air from the front and reduces cooling efficiency. Mr. Todd gets around the difficulty very simply; he merely reverses the fan and has it suck in air from the rear, past the engine, and blow it out through the radiator, after which the heated blast is channeled around the outside of the engine compartment and then deflected outboard. Rights in the patent, No. 2,341,165, are assigned to the General Motors Corporation.

Science News Letter, February 19, 1944

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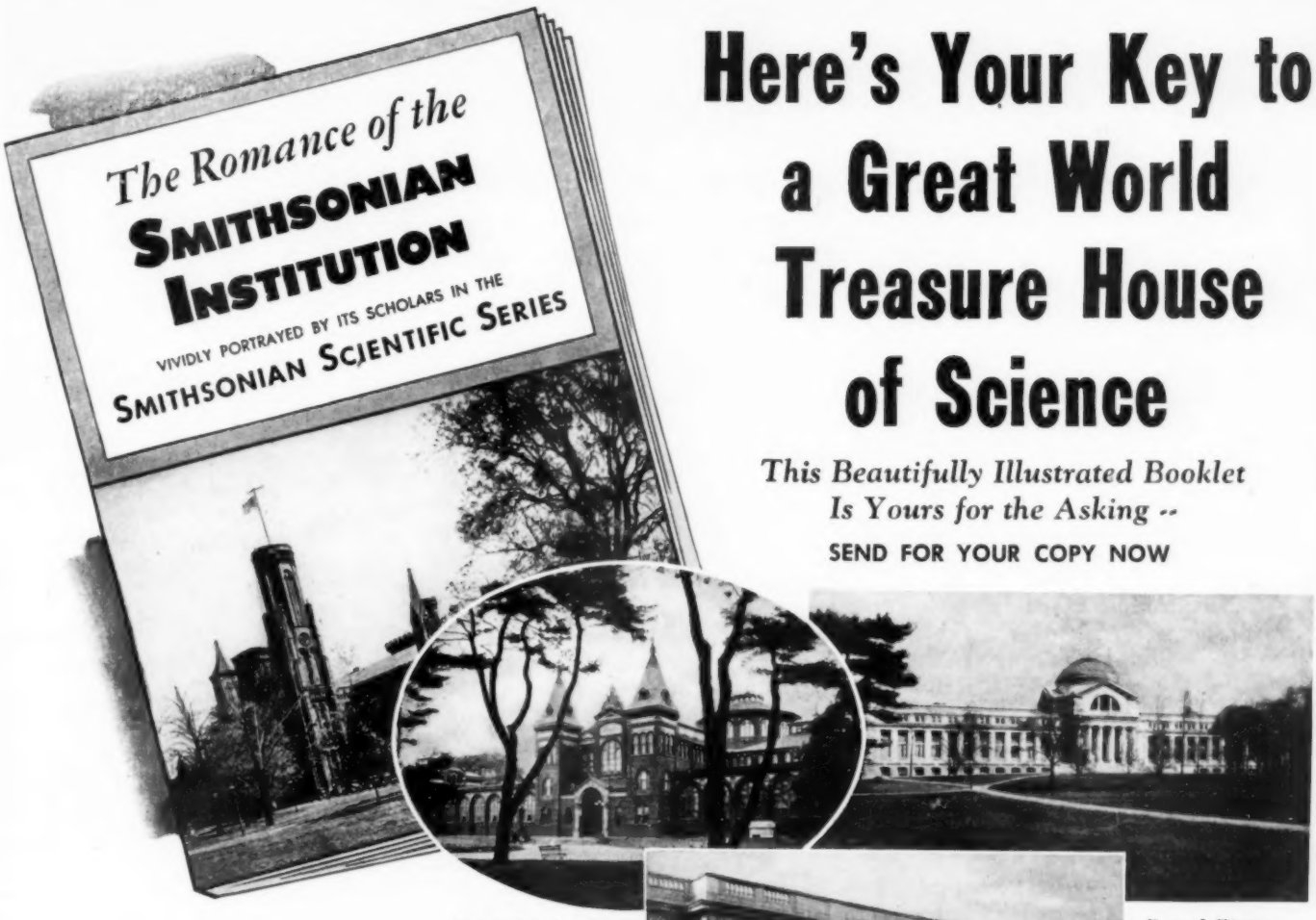

Arts and Industries Building

Natural History Building

Freer Gallery of Art

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GENERAL SCIENCE

260 Honorable Mentions

Awards given to 179 boys and 81 girls in the Third Annual Science Talent Search. All will be recommended to universities as being students of unusual ability.

➤ HONORABLE mentions to 179 boys and 81 girls in the Third Annual Science Talent Search have been announced by Science Clubs of America, bringing to 300 the high school seniors cited in this nation-wide selection of youth who have scientific ability.

The 260 awarded honorable mentions are located in 39 states and the District of Columbia. They were chosen from among some 15,000 entrants, 3,000 of whom completed the science aptitude examination, submitted recommendations and scholarship records and wrote essays on the subject, "My Scientific Project."

Forty entrants have already been announced as winners of trips to a five-day Science Talent Institute in Washington in March, where they will compete for $11,000 in Westinghouse Science Scholarships.

All of those selected for honors will be recommended as students of unusual ability to scholarship-awarding colleges and universities.

It has been estimated that any boy who won honorable mention in the First Annual Science Talent Search was offered $370.79 worth of scholarships. Any girl achieving such an honor averaged $326.35 in possible scholarships. The total monetary value of honorable mention in the first search is estimated to be about $78,000.

The honorable mentions in the Second Annual Science Talent Search were awarded and earned scholarships in similar or greater quantity, and there is every reason to believe that the boys and girls so honored this year will have the good fortune to qualify for valuable scholarships and other financial assistance in the colleges, universities and technical schools of their choice. The judges found all 300 winners to be students of outstanding ability.

Among the honorable mentions 35% of the boys and 37% of the girls are first or second in their high school graduating classes. They have studied science for some years: 30% of the boys have had at least four years of high school science and 22% of the girls have studied science for a similar period. A larger number have studied science for three years: 73% of the boys; 64% of the girls.

All the honorable mentions have crowded records of extra-curricular activities. Science clubs are among the more popular activities: 35 of the girls belong to science clubs and 9 of them hold elective offices in them. As for the boys: 114 of them belong to science clubs and 38 of them are presidents of their clubs or hold other elective offices in them.

The Science Talent Search is made possible financially by the Westinghouse Electric & Manufacturing Co. and is conducted by Science Clubs of America, one of the activities of Science Service.

Science Clubs of America has more than 4,000 affiliated science clubs with 100,000 or more members with a vocational or avocational interest in science.

Science News Letter, February 19, 1944

SOCIOLOGY

Women Have Won Place In Industry Permanently

➤ WOMEN can do 80% of the jobs done by men and have won themselves a permanent place in industry, Dr. C. O. Sappington, of Chicago, reported to the Industrial Hygiene Foundation as a result of a Foundation-sponsored survey he has made in 54 war plants in 10 states.

Sick absences are higher for women but their accident rates are, generally speaking, lower, Dr. Sappington found. Women apparently are bothered by smaller ills and visit plant dispensaries more frequently than men but no outstanding health problems were found among the women war workers.

Dr. Sappington advises management that women in industry "cannot be taken for granted, neither should they be coddled or pampered. The best results are forthcoming when ordinary politeness, courtesy and consideration are used."

Science News Letter, February 19, 1944

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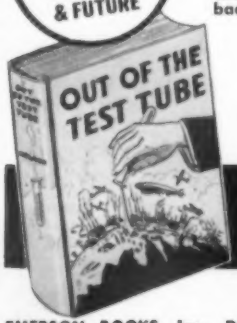

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HORTICULTURE

NATURE RAMBLINGS

by Frank Thone

In Alien Soil

➤ VICTORY gardens will grow on German soil this spring, even though their cultivators are prisoners in the hands of the enemy. To the International Committee of the Red Cross in Geneva, for distribution to prison camps in Europe where members of American armed forces are held, the American Red Cross has sent gardening kits, consisting of assorted seed sufficient to plant one-eighth of an acre and enough small hand tools to work the soil. Number of kits sent to any camp will depend on the request made by the camp spokesman.

Kinds and quantities of seed were decided upon by horticulturists of the U. S. Department of Agriculture, who gave special consideration to climatic and soil conditions in western Europe, as well as to the needs and preferences of the men.

The vegetable-seed assortment consists of the following: tomato, carrot, sweet-corn, green beans, peas, lettuce, radish, spinach, chard, cabbage, beet, onion, parsnip and turnip. To give a little bright floral relief to the utilitarian garden six packets each of zinnia, marigold and candytuft seed are also included.

Gardening has a double value for prisoners of war. Not only do they receive decided nutritional benefits from the fresh vegetables and a relief from the monotony and inadequacy of prison rations, but they get a real psychological "lift" from the exercise involved in garden work and the satisfaction of seeing their own crops grow.

A letter from one of the British camps describes a "mixed plantation," in the camp as it looked last June. There were lettuce and cucumber plants, beets, radishes, kohlrabi, tomatoes and a spinach bed, divided from the salads by a row of dwarf peas. The letter concludes: "Although somewhat cramped for room, the herbaceous border will, we hope, make quite a good show in late summer with wall-flowers, scabious stocks and violas. The holding is under the anxious care of five townsmen and one countryman and we have no 'experimental stations' to call up for advice, but our only unsolved problem is space."

Science News Letter, February 19, 1944

Books of the Week

➤ WAR has made us more geography-conscious than we ever have been in all our previous national lifetime; and the opening of the Alcan Highway has focussed some of that consciousness on the great empire of mountains, forest and coastlands held severally by the United States and Canada in the northwestern corner of this continent. Main facts about this great area are compactly presented by Benjamin H. Kizer in THE U. S.-CANADIAN NORTHWEST, prepared under the sponsorship of the American Council, Institute of Pacific Relations. (*Princeton Univ. Press*, $1)

Science News Letter, February 19, 1944

➤ BECAUSE it includes the extremely important genus *Derris*, as well as other plants of economic significance, J. Francis Macbride's new volume covering the legumes, in the FLORA OF PERU series (*Field Museum of Natural History*, $3.50) will interest economic botanists as well as those whose interests are more strictly in the field of taxonomy.

Science News Letter, February 19, 1944

Just Off the Press

ABC'S OF SCAPEGOATING—foreword by Gordon W. Allport—*Central YMCA College*, 72 p., 25c, paper.

THE AMERICAN WOMAN: The Feminine Side of a Masculine Civilization—Ernest R. Groves—*Emerson*, 465 p., $3.50, 2nd ed. rev.

BASIC MATHEMATICS FOR WAR AND INDUSTRY—Paul H. Daus, John M. Gleason and William M. Whyburn—*Macmillan*, 275 p., $2.

THE CHEMISTRY OF ORGANIC MEDICINAL PRODUCTS—Glenn L. Jenkins and Walter H. Hartung—*Wiley*, 675 p., $6.50, 2nd ed.

CHINA HANDBOOK 1937-1943: A Comprehensive Survey of Major Developments in China in Six Years of War—Compiled by Chinese Ministry of Information—*Macmillan*, 965 p., $5.

ELECTRON-OPTICS — Paul Hatschek—translated by Arthur Palme — *Amer. Photographic Pub.*, 161 p., illus., $3. The book was written in German in 1935 and 1936 in order to explain the fundamentals of television and amplifying tubes and to make the comparatively new science of electronics understandable to those who had no previous knowledge of the subject.

FOOD—Frank A. Pearson and Don Paarlberg —*Knopf*, 249 p., $2.75.

THE FRESH WATER TRICLADS OF MICHIGAN — Roman Kenk — *Univ. of Mich. Press*, 51 p., illus., 50c, misc. pub. No. 60, paper.

GAUGING PUBLIC OPINION—Hadley Cantril and research associates—*Princeton Univ. Press*, 318 p., $3.75.

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